

U.S. Application Serial No. 09/673,532
Reply to Office Action of December 1, 2006

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**PATENT
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IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application. An identifier indicating the status of each claim is provided.

Listing of Claims

1. (Currently Amended) An image-signal processing apparatus for processing an input image signal at a position of each pixel, said input image signal having ~~any~~ only one of various color components, said apparatus comprising:
 - defect-correcting means for correcting defective pixels in the input image signal;
 - clamping means for clamping the input image signal to eliminate shifted components of the defect-corrected image signal;
 - white-balancing means for white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;
 - extraction means for extracting a plurality of pixels located near each pixel of interest of the ~~clamped white-balanced~~ image signal;
 - class-determining means for determining a class from the pixels extracted by the extraction means; and
 - pixel-generating means for generating a pixel at a position of the pixel of interest in accordance with the class determined by the class-determining means, said pixel having ~~a~~ all color ~~components~~ component ~~different from at least the color component of the pixel of interest,~~
- wherein the plurality of pixels extracted by the extraction means and used by the class determining means includes at least one pixel that is not adjacent to the pixel of interest.

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2. (Canceled)

3. (Original) The image-signal processing apparatus according to claim 1, characterized in that the pixel-generating means comprises storage means for storing a set of prediction coefficients for each class and operation means for performing an operation on a set of prediction coefficients which corresponds to the class determined by the class-determining means and the pixels located near the pixel of interest which have been extracted by the extraction means, thereby to generate a pixel having a color component different from at least the color component of the pixel of interest.

4. (Original) The image-signal processing apparatus according to claim 3, characterized in that the operation means performs an operation on a linear combination of the set of prediction coefficients and the values of the pixels located near the pixel of interest.

5. (Original) The image-signal processing apparatus according to claim 3, characterized in that the extraction means extracts at least one different pixel and supplies the same to the class-determining means and the operation means.

6. (Original) The image-signal processing apparatus according to claim 1, characterized in that the color component represents a color of red, blue or green.

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7. (Original) The image-signal processing apparatus according to claim 1, characterized by further comprising acquisition means for acquiring an image signal having a pixel at each pixel position, said pixel having one of various color components.

8. (Original) The image-signal processing apparatus according to claim 7, characterized in that the acquisition means is a solid-state imaging element.

9. (Original) The image-signal processing apparatus according to claim 8, characterized in that the solid-state imaging element is a CCD image sensor of the Bayer arrangement.

10. (Currently Amended) An image-signal processing method of processing an input image signal at a position of a pixel, said input image signal having ~~any~~only one of various color components, said method comprising:

a defect-correcting step of correcting defective pixels in the input image signal;

a clamping step of clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

a white-balancing step of white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

an extraction step of extracting a plurality of pixels located near each pixel of interest of the ~~clamped~~white-balanced image signal;

a class-determining step of determining a class from the pixels extracted in the extraction step; and

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a pixel-generating step of generating a pixel at a position of the pixel of interest in accordance with the class determined in the class-determining step, said pixel having ~~a all~~ color components component different from at least the color component of the pixel of interest, wherein the plurality of pixels extracted in the extraction step and used in the class determining step includes at least one pixel that is not adjacent to the pixel of interest.

11. (Canceled)

12. (Original) The image-signal processing method according to claim 10, characterized in that in the pixel-generating step, operation means performs an operation on a set of prediction coefficients which corresponds to the class determined in the class-determining step and the pixels located near the pixel of interest which have been extracted in the extraction step, thereby to generate a pixel having the different color component.

13. (Original) The image-signal processing method according to claim 12, characterized in that in the pixel-generating step, an operation is performed on a linear combination of the set of prediction coefficients and the values of the pixels located near the pixel of interest.

14. (Original) The image-signal processing method according to claim 12, characterized in that in the extracting step, at least one different pixel is extracted for use in the class-determining step and the pixel-generating step.

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15. (Original) The image-signal processing method according to claim 10, characterized in that the color component represents a color of red, blue or green.

16. (Original) The image-signal processing method according to claim 10, characterized by further comprising an acquisition step of acquiring an image signal having a pixel at each pixel position, said pixel having one of various color components.

17. (Original) The image-signal processing method according to claim 16, characterized in that in the acquisition step, a solid-state imaging element acquires the image signal.

18. (Original) The image-signal processing method according to claim 17, characterized in that in the acquisition step, a CCD image sensor of the Bayer arrangement acquires the image signal.

19. (Currently Amended) A recording medium storing a computer program designed to process an input image signal at a position of a pixel, said input image signal having any-only one of various color components, said computer program comprising:

a defect-correcting step of correcting defective pixels in the input image signal;

a clamping step of clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

a white-balancing step of white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

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an extraction step of extracting a plurality of pixels located near each pixel of interest of the ~~clamped-white-balanced~~ image signal;

a class-determining step of determining a class from the pixels extracted in the extraction step; and

a pixel-generating step of generating a pixel at a position of the pixel of interest in accordance with the class determined in the class-determining step, said pixel having a color components~~component different from at least the color component of the pixel of interest,~~

wherein the plurality of pixels extracted in the extraction step and used in the class determining step includes at least one pixel that is not adjacent to the pixel of interest.

20. (Canceled)

21. (Original) The recording medium according to claim 19, characterized in that in the pixel-generating step, operation means performs an operation on a set of prediction coefficients which corresponds to the class determined in the class-determining step and the pixels located near the pixel of interest which have been extracted in the extraction step, thereby to generate a pixel having the different color component.

22. (Original) The recording medium according to claim 21, characterized in that in the pixel-generating step, an operation is performed on a linear combination of the set of prediction coefficients and the values of the pixels located near the pixel of interest.

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23. (Original) The recording medium according to claim 21, characterized in that in the extraction step, at least one different pixel is extracted for use in the class-determining step and the pixel-generating step.

24. (Original) The recording medium according to claim 19, characterized in that the color component represents a color of red, blue or green.

25. (Original) The recording medium according to claim 19, characterized in the computer program further comprises an acquisition step of acquiring an image signal having a pixel at each pixel position, said pixel having one of various color components.

26. (Original) The recording medium according to claim 25, characterized in that in the acquisition step, a solid-state imaging element acquires the image signal.

27. (Original) The recording medium according to claim 26, characterized in that in the acquisition step, a CCD image sensor of the Bayer arrangement acquires the image signal.

28-36. (Canceled)

37. (Currently Amended) An image-signal processing apparatus for processing an input image signal, said input image signal having a prescribed number of sample

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values which constitute one image and each of which represents ~~any~~only one of various colors at each pixel, said apparatus comprising:

defect-correcting means for correcting defective pixels in the input image signal;

clamping means for clamping the input image signal to eliminate shifted

components of the defect-corrected image signal;

white-balancing means for white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

extraction means for extracting a plurality of pixels located near each pixel of interest of the ~~clamped~~white-balanced image signal;

class-determining means for determining a class from the pixels extracted by the extraction means; and

output image-signal generating means for generating an output image signal having more sample values than the prescribed number, for the various colors, by processing each pixel of the input image signal in accordance with the class determined by the class-determining means,

wherein the plurality of pixels extracted by the extraction means and used by the class determining means includes at least one pixel that is not adjacent to the pixel of interest.

38. (Original) The image-signal processing apparatus according to claim 37, characterized in that the output image-signal generating means comprises storage means for storing a set of prediction coefficients for each class and operation means for performing an operation on a set of prediction coefficients which corresponds to the class determined by the

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class-determining means and the pixels located near the pixel of interest which have been extracted by the extraction means, thereby to generate the output image signal.

39. (Currently Amended) An image-signal processing method of processing an input image signal, said input image signal having a prescribed number of sample values which constitute one image and each of which represents any-only one of various colors, said method comprising:

a defect-correcting step of correcting defective pixels in the input image signal;

a clamping step of clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

a white-balancing step of white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

an extraction step of extracting a plurality of pixels located near each pixel of interest of the ~~clamped~~ white-balanced image signal;

a class-determining step of determining a class from the pixels extracted in the extraction step; and

an output image-signal generating step of generating an output image signal having more sample values than the prescribed number, for the various colors, by processing each pixel of the input image signal in accordance with the class determined in the class-determining step,

wherein the plurality of pixels extracted in the extraction step and used in the class determining step includes at least one pixel that is not adjacent to the pixel of interest.

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40. (Original) The image-signal processing method according to claim 39, characterized in that in the output image-signal generating step, an operation is performed on a set of prediction coefficients which corresponds to the class determined in the class-determining step and the pixels located near the pixel of interest which have been extracted in the extraction step, thereby to generate the output image signal.

41. (Currently Amended) A recording medium storing a computer program designed to process an input image signal, said input image signal having a prescribed number of sample values which constitute one image and each of which represents ~~any~~only one of various colors, said computer program comprising:

a defect-correcting step of correcting defective pixels in the input image signal;

a clamping step of clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

a white-balancing step of white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

an extraction step of extracting a plurality of pixels located near each pixel of interest of the ~~clamped~~clamped-white-balanced image signal;

a class-determining step of determining a class from the pixels extracted in the extraction step; and

an output image-signal generating step of generating an output image signal having more sample values than the prescribed number, for the various colors, by processing each pixel of the input image signal in accordance with the class determined in the class-determining step,

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wherein the plurality of pixels extracted in the extraction step and used in the class determining step includes at least one pixel that is not adjacent to the pixel of interest.

42. (Original) The recording medium according to claim 41, characterized in that in the output image-signal generating step, an operation is performed on a set of prediction coefficients which corresponds to the class determined in the class-determining step and the pixels located near the pixel of interest which have been extracted in the extraction step, thereby to generate the output image signal.

43-48. (Canceled)

49. (Currently Amended) An image-signal processing apparatus for processing an input image signal at a position of each pixel, said input image signal having any only one of various color components, said apparatus comprising:

defect-correcting means for correcting defective pixels in the input image signal;

clamping means for clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

white-balancing means for white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

extraction means for extracting a plurality of pixels located near each pixel of interest of the clamped-white-balanced image signal, each pixel having a color component of the highest density of all color components;

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class-determining means for determining a class from the pixels extracted by the extraction means; and

pixel-generating means for generating a pixel in accordance with the class determined by the class-determining means, said pixel having a-all color components-component ~~different from at least the color component of the pixel of interest,~~

wherein the plurality of pixels extracted by the extraction means and used by the class determining means includes at least one pixel that is not adjacent to the pixel of interest.

50. (Original) The image-signal processing apparatus according to claim 49, characterized in that the pixel-generating means comprises storage means for storing a set of prediction coefficients for each class and operation means for performing an operation on a set of prediction coefficients which corresponds to the class determined by the class-determining means and the pixels located near the pixel of interest which have been extracted by the extraction means, thereby to generate the pixel having the different color component.

51. (Original) The image-signal processing apparatus according to claim 49, characterized in that the pixel-generating means generates a pixel having all color components at the position of the pixel of interest.

52. (Currently Amended) An image-signal processing method of processing an input image signal at a position of each pixel, said input image signal having any-only one of various color components, said method comprising:

a defect-correcting step of correcting defective pixels in the input image signal;

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a clamping step of clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

a white-balancing step of white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

an extraction step of extracting a plurality of pixels located near each pixel of interest of the ~~clamped~~ white-balanced image signal, each pixel having a color component of the highest density of all color components;

a class-determining step of determining a class from the pixels extracted in the extraction step; and

a pixel-generating step of generating a pixel in accordance with the class determined in the class-determining step, said pixel having a all color component ~~different from at least the color component of the pixel of interest,~~

wherein the plurality of pixels extracted in the extraction step and used in the class determining step includes at least one pixel that is not adjacent to the pixel of interest.

53. (Original) The image-signal processing method according to claim 52, characterized in that in the pixel-generating step, an operation is performed on a set of prediction coefficients which corresponds to the class determined in the class-determining step and the pixels located near the pixel of interest which have been extracted in the extraction step, thereby to generate the pixel having the different color component.

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54. (Original) The image-signal processing apparatus according to claim 52, characterized in that in the pixel-generating step, a pixel having all color components is generated at the position of the pixel of interest.

55. (Currently Amended) A recording medium storing a computer program designed to process an input image signal at a position of each pixel, said input image signal having ~~any~~only one of various color components, said computer program comprising:

a defect-correcting step of correcting defective pixels in the input image signal;

a clamping step of clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

a white-balancing step of white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

an extraction step of extracting a plurality of pixels located near each pixel of interest of the ~~clamped~~white-balanced image signal, each pixel having a color component of the highest density of all color components;

a class-determining step of determining a class from the pixels extracted in the extraction step; and

a pixel-generating step of generating a pixel in accordance with the class determined in the class-determining step, said pixel having ~~a~~all color components ~~component~~ ~~different from at least the color component of the pixel of interest,~~

wherein the plurality of pixels extracted in the extraction step and used in the class determining step includes at least one pixel that is not adjacent to the pixel of interest.

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56. (Original) The recording medium according to claim 55, characterized in that in the pixel-generating step, an operation is performed on a set of prediction coefficients which corresponds to the class determined in the class-determining step and the pixels located near the pixel of interest which have been extracted in the extraction step, thereby to generate the pixel having the different color component.

57. (Original) The recording medium according to claim 55, characterized in that in the pixel-generating step, a pixel having all color components is generated at the position of the pixel of interest.

58-63. (Canceled)

64. (Currently Amended) An image-signal processing apparatus for processing an input image signal at a position of each pixel, said input image signal having any only one of various color components, said apparatus comprising:

defect-correcting means for correcting defective pixels in the input image signal;

clamping means for clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

white-balancing means for white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

extraction means for extracting a plurality of pixels for each color component, from pixels located near each pixel of interest of the ~~elamped~~ white-balanced image signal;

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class-determining means including a characteristic-data generating section for generating characteristic data about the pixels of each color component, from the pixels of each color component which have been extracted by the extraction means, and a class-determining section for determining a class from the characteristic data generated for each color component; and

pixel-generating means for generating a pixel in accordance with the class determined by the class-determining means, said pixel having a all color components component different from at least the color component of the pixel of interest,

wherein the plurality of pixels extracted by the extraction means and used by the class determining means includes at least one pixel that is not adjacent to the pixel of interest.

65. (Original) The image-signal processing apparatus according to claim 64, characterized in that the characteristic-data generating section generates, as the characteristic data, a space activity of the pixels of each color component, which have been extracted by the extraction means.

66. (Original) The image-signal processing apparatus according to claim 65, characterized in that the characteristic-data generating section generates the space activity by performing of ADRC (Adaptive Dynamic Range Coding) process on the pixels of each color component.

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67. (Original) The image-signal processing apparatus according to claim 64, characterized in that the extraction means extracts the pixels corresponding to each color component from pixels existing in a region near the pixel of interest.

68. (Currently Amended) An image-signal processing method of processing an input image signal at a position of each pixel, said input image signal having ~~any~~ only one of various color components, said method comprising:

a defect-correcting step of correcting defective pixels in the input image signal;

a clamping step of clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

a white-balancing step of white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

an extraction step of extracting a plurality of pixels for each color component, from pixels located near each pixel of interest of the ~~clamped~~ white-balanced image signal;

a class-determining step of generating characteristic data about the pixels of each color component, from the pixels of each color component which have been extracted in the extraction step and determining a class from the characteristic data generated for each color component; and

a pixel-generating step of generating a pixel in accordance with the class determined in the class-determining step, said pixel having ~~a all color components component~~ different from at least the color component of the pixel of interest,

wherein the plurality of pixels extracted in the extraction step and used in the class determining step includes at least one pixel that is not adjacent to the pixel of interest.

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69. (Original) The image-signal processing method according to claim 68, characterized in that in the characteristic-data generating step, a space activity of the pixels of each color component, which have been extracted in the extraction step, is generated as the characteristic data.

70. (Original) The image-signal processing method according to claim 69, characterized in that in the class-determining step, the space activity is generated by performing of ADRC (Adaptive Dynamic Range Coding) process on the pixels of each color component.

71. (Original) The image-signal processing method according to claim 68, characterized in that the pixels corresponding to each color component from pixels existing in a region near the pixel of interest are extracted in the extraction step.

72. (Currently Amended) A recording medium storing a computer program designed to process an input image signal at a position of each pixel, said input image signal having ~~any~~only one of various color components, said computer program comprising:

a defect-correcting step of correcting defective pixels in the input image signal;

a clamping step of clamping the input image signal to eliminate shifted components of the defect-corrected image signal;

a white-balancing step of white-balancing the input image signal to correct the gain of the clamped image signal supplied from the clamping means;

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an extraction step of extracting a plurality of pixels for each color component, from pixels located near each pixel of interest of the ~~clamped-white-balanced~~ image signal;

a class-determining step of generating characteristic data about the pixels of each color component, from the pixels of each color component which have been extracted in the extraction step and determining a class from the characteristic data generated for each color component; and

a pixel-generating step of generating a pixel in accordance with the class determined in the class-determining step, said pixel having a all color components component different from at least the color component of the pixel of interest,

wherein the plurality of pixels extracted in the extraction step and used in the class determining step includes at least one pixel that is not adjacent to the pixel of interest.

73. (Original) The recording medium according to claim 72, characterized in that in the characteristic-data generating step, a space activity of the pixels of each color component, which have been extracted in the extraction step, is generated as the characteristic data.

74. (Original) The recording medium according to claim 73, characterized in that in the class-determining step, the space activity is generated by performing of ADRC (Adaptive Dynamic Range Coding) process on the pixels of each color component.

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75. (Original) The recording medium according to claim 72, characterized in that the pixels corresponding to each color component from pixels existing in a region near the pixel of interest are extracted in the extraction step.

76-84. (Canceled)